

INFORMATION SHEET 2.2-1

Fundamentals of Networking

LEARNING OBJECTIVES

After reading this **INFORMATION SHEET, STUDENT(S) MUST** be able to:

- Know the fundamentals of network.
- Discuss and elaborate different types of network.

INTRODUCTION

A **computer network** is a group of computer systems and other computing hardware devices that are linked together through communication channels to facilitate communication and resource-sharing among a wide range of users. Networks may be classified according to a wide variety of characteristics such as medium used to transport the data, communications protocol used, scale, topology, organizational scope, etc.

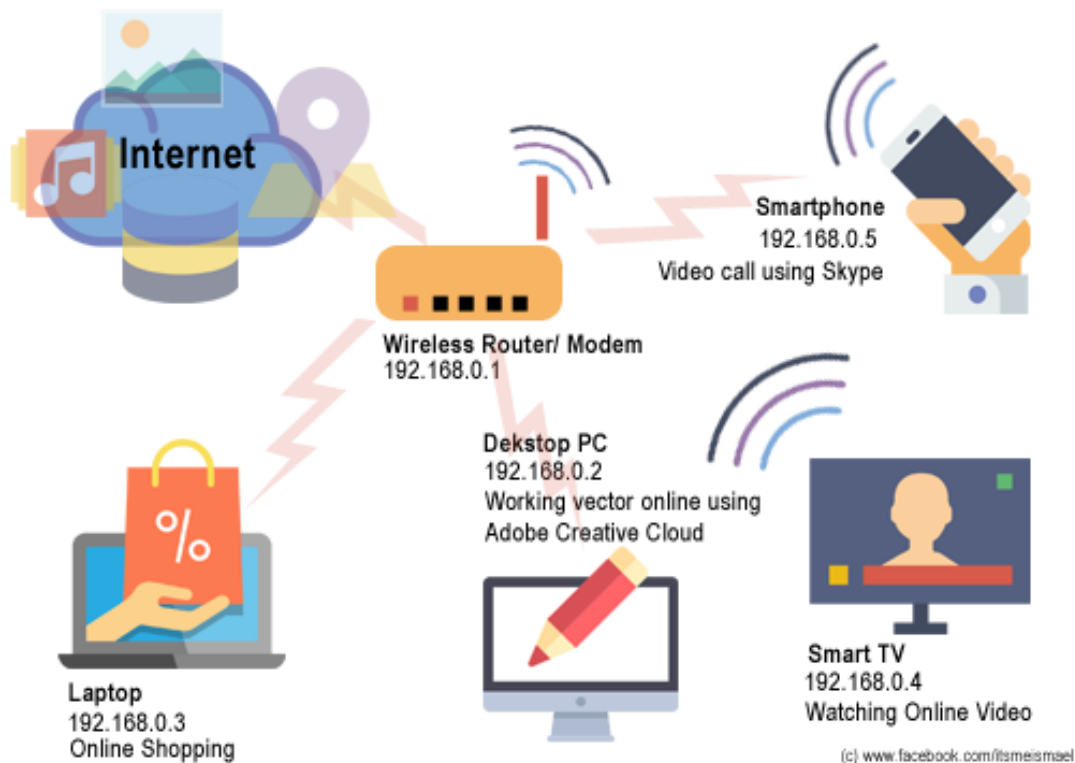


Figure 1.1: **Modern connected nodes**

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			Revision # 01	

One of the most punctual precedents of a computer network was a system of communicating computers that worked as a major aspect of the U.S. military's Semi-Automatic Ground Environment (SAGE) radar framework. In 1969, the University of California at Los Angeles, the Stanford Research Institute, the University of California at Santa Barbara and the University of Utah were associated as a major aspect of the Advanced Research Projects Agency Network (ARPANET) venture. It is this system that developed to become what we currently called "Internet".


Networks are used to:

- Facilitate communication by means of email, video conferencing, texting, and so on.
- Enable different clients to share hardware resources like a printer or scanner.
- Enable file sharing over the system.
- Allow for the sharing of software or working projects on a remote network.
- Make data easier to access and keep up among network clients.

Example of various network scales are:

A Local area network (LAN), or, in other words, small network constrained to a small geographic area. An example of a LAN would be a computer network within a building.

- Operate within a small geographic area.
- Allow multi-access to high-transfer speed media.
- Control network privately under a local administration.
- Provide full-time availability to local services.

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			Version 1.1.2019	
			Revision # 01	

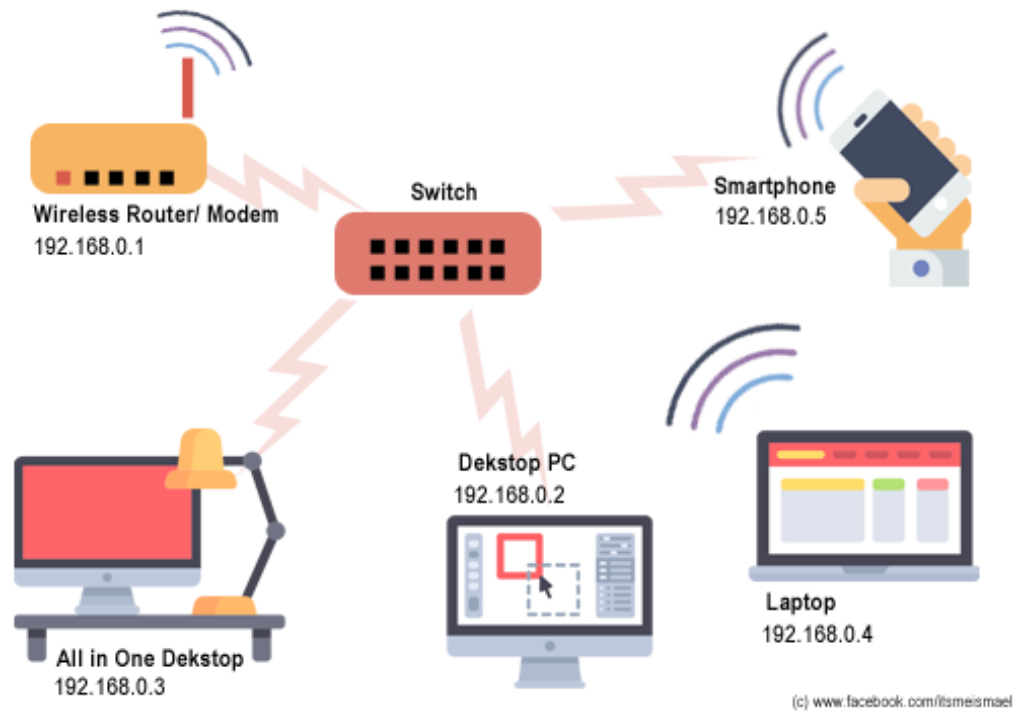

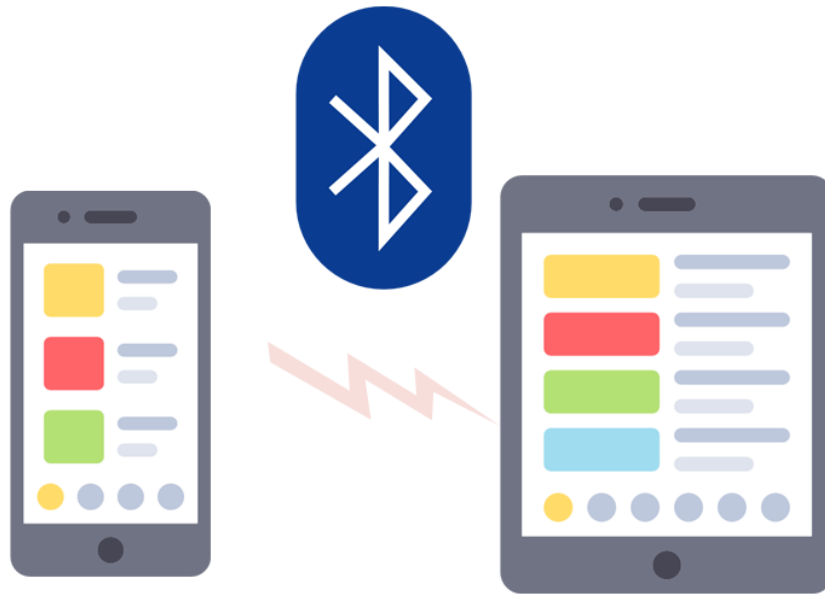


Figure 1.2: **Local Area Network (LAN)**

A **Personal Area Network (PAN)** is a computer network used for communication among computer devices, including smartphone and tablet, in proximity to an individual's body. The reach of a PAN is typically a few meters. PANs can be used for communication among the personal devices themselves (intrapersonal communication), or for connecting to a higher level network and the Internet. Using Lenovo ShareIt app across devices is great instance of PAN network.

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			Version 1.1.2019	
			Revision # 01	



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*Figure 1.3 : **Personal Area Network (PAN)***

Campus Area Network, Campus Network, Controller Area Network, Corporate area network and often Cluster Area Network or CAN

It is a computer network made up of an interconnection of local area networks (LANs) within a limited geographical area. The networking equipment (switches, routers) and transmission media (optical fiber, copper plant, Cat5 cabling etc.) are almost entirely owned by the campus tenant / owner: an enterprise, university, government etc. It can be taken as the metropolitan network that has the specific settings at the small area just like a computer lab in the university.

Metropolitan Area Network

A **metropolitan area network (MAN)** is a hybrid between a LAN and a WAN. Like a WAN, it connects two or more LANs in the same geographic area. A MAN, for example, might connect two different buildings or offices in the same city/municipality.

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			Version 1.1.2019	
			Revision # 01	

Masinloc City e-Health Tracking System

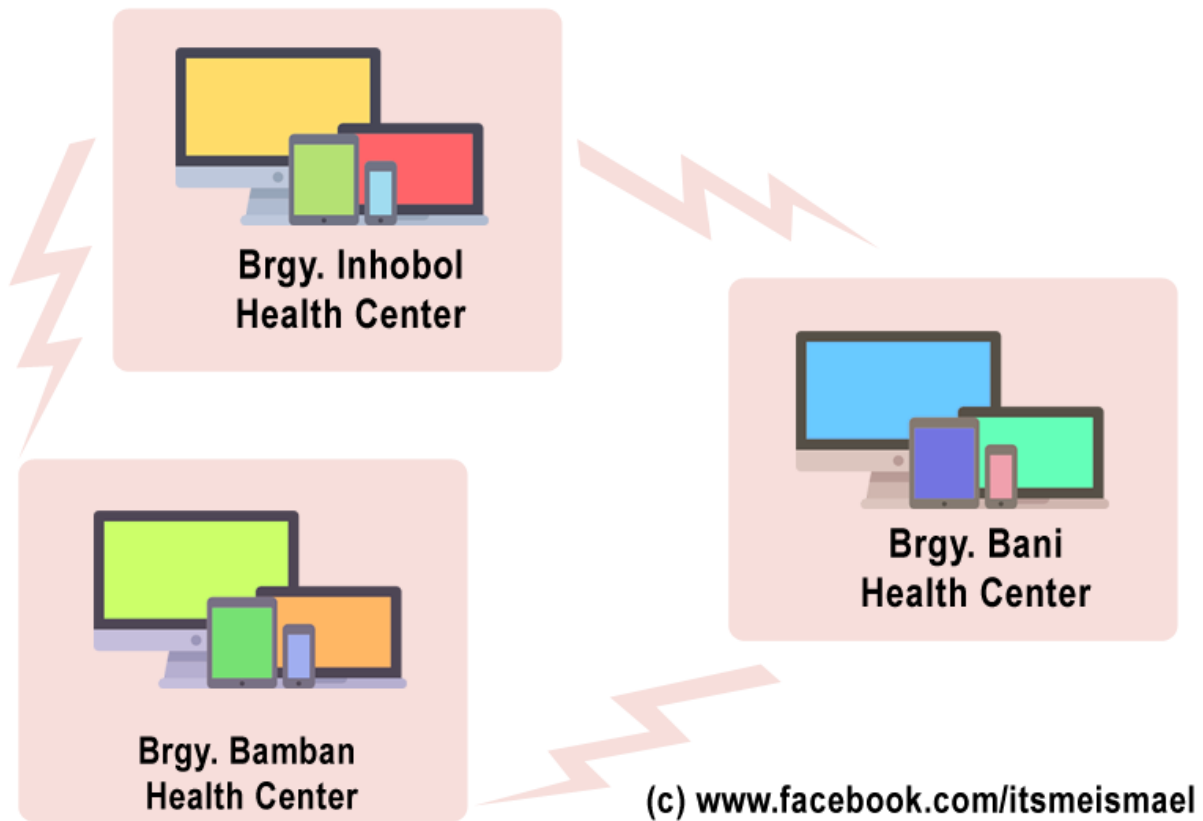



Figure 1.4: **Metropolitan Area Network**

Wide Area Network

A **wide area network (WAN)** is a computer network that covers a broad area (i.e., any network whose communications links cross metropolitan, regional, or national boundaries). This is in contrast with personal area networks (PANs), local area networks (LANs), campus area networks (CANs), or metropolitan area networks (MANs) which are usually limited to a room, building, campus or specific metropolitan area (e.g., a city) respectively,

Computers connected to a wide-area network are often connected through public networks, such as the telephone system. They can also be connected through leased

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			Version 1.1.2019	
			Revision # 01	


lines or satellites. The largest WAN in existence is the Internet.



Figure 1.5: **Wide Area Network**

Storage Area Network

A **storage area network (SAN)** is a dedicated storage network that provides access to consolidated, block level storage. SANs are used primarily to make storage devices (such as disk arrays, tape libraries, and optical jukeboxes) accessible to servers so that the devices appear as locally attached to the operating system. A SAN typically has its own network of storage devices that are generally not accessible through the regular network by regular devices.

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			Version 1.1.2019	
			Revision # 01	

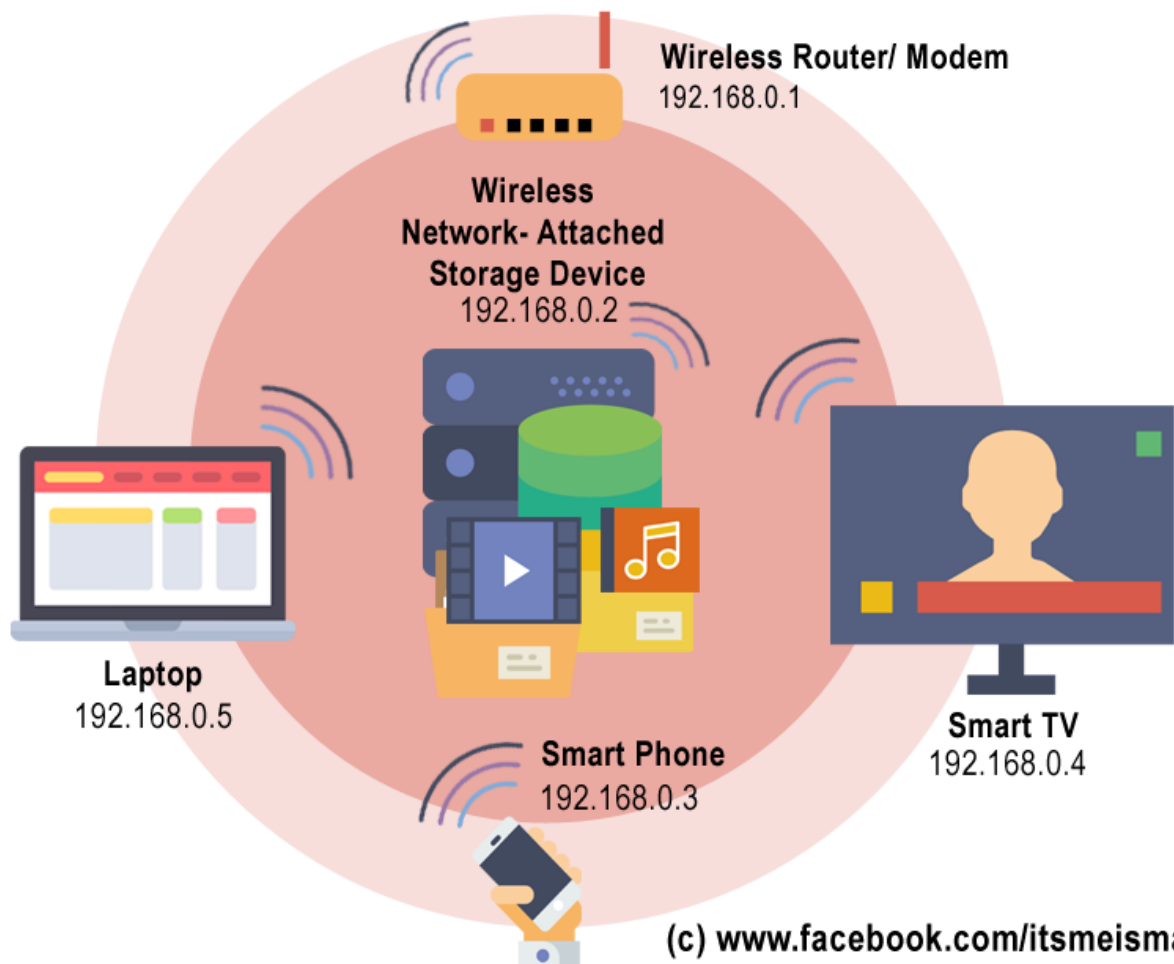



Figure 1.6: **Storage Area Network**

The Internet

The Internet is a global system of interconnected computer networks that use the standard Internet Protocol Suite (TCP/IP) to serve billions of users worldwide. It is a network of networks that consists of millions of private, public, academic, business, and government networks, of local to global scope, that are linked by a broad array of electronic, wireless and optical networking technologies. The Internet can also be defined as a worldwide interconnection of computers and computer networks that facilitate the sharing or exchange of information among users. The Internet carries a vast range of information resources and services, such as the inter-linked hypertext documents of the **World Wide Web (WWW)** and the infrastructure to support electronic mail etc.

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			Version 1.1.2019	
			Revision # 01	

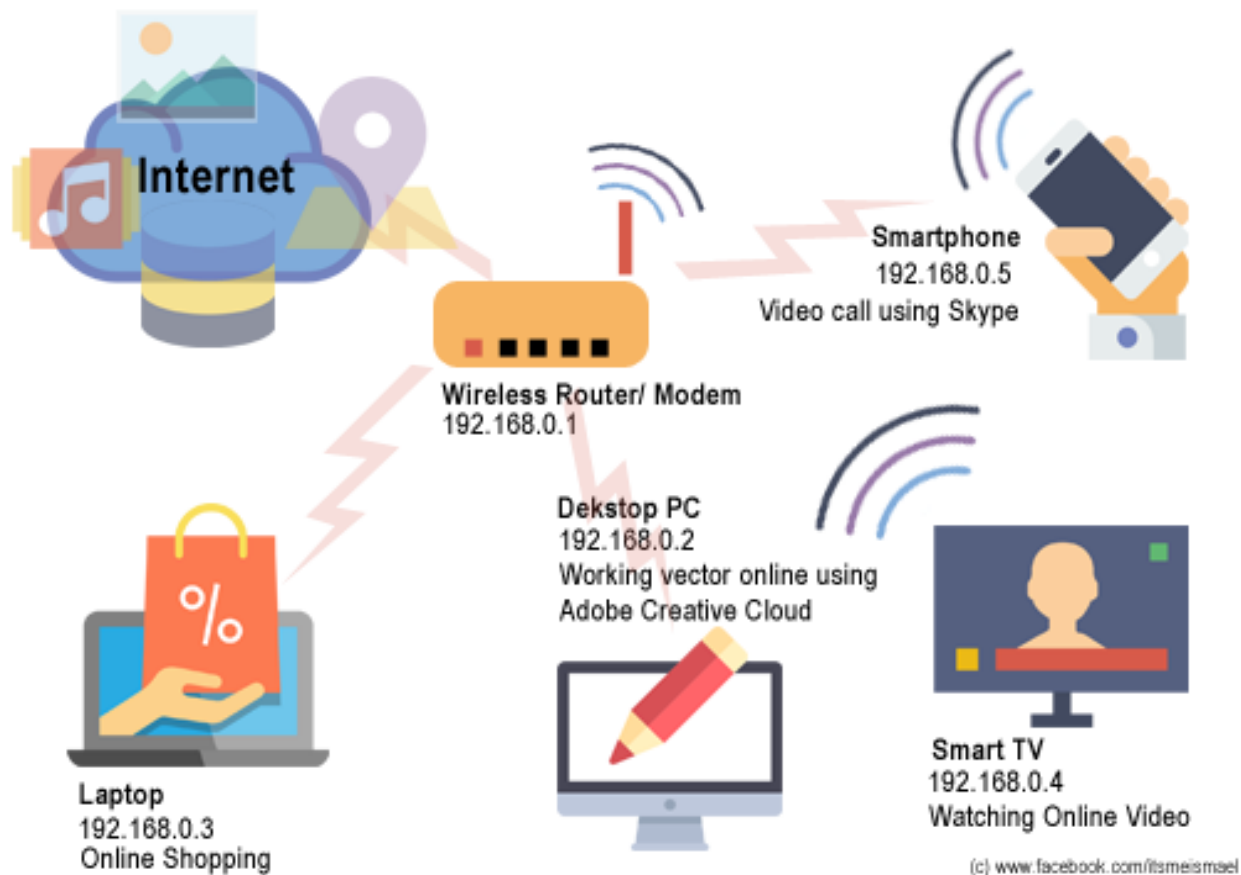



Figure 1.7: ***Different devices connected to the internet***

Virtual Private Network

A **VPN** is a private network that is constructed within a public network infrastructure such as the global Internet. a telecommuter can access the network of the company headquarters through the Internet by building a secure tunnel between the telecommuter's PC and a VPN router in the headquarters. It is a mechanism for providing secure, reliable transport over Internet. VPNs are frequently used by remote workers or companies with remote offices to share private data and network resources.

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			Version 1.1.2019	
			Revision # 01	

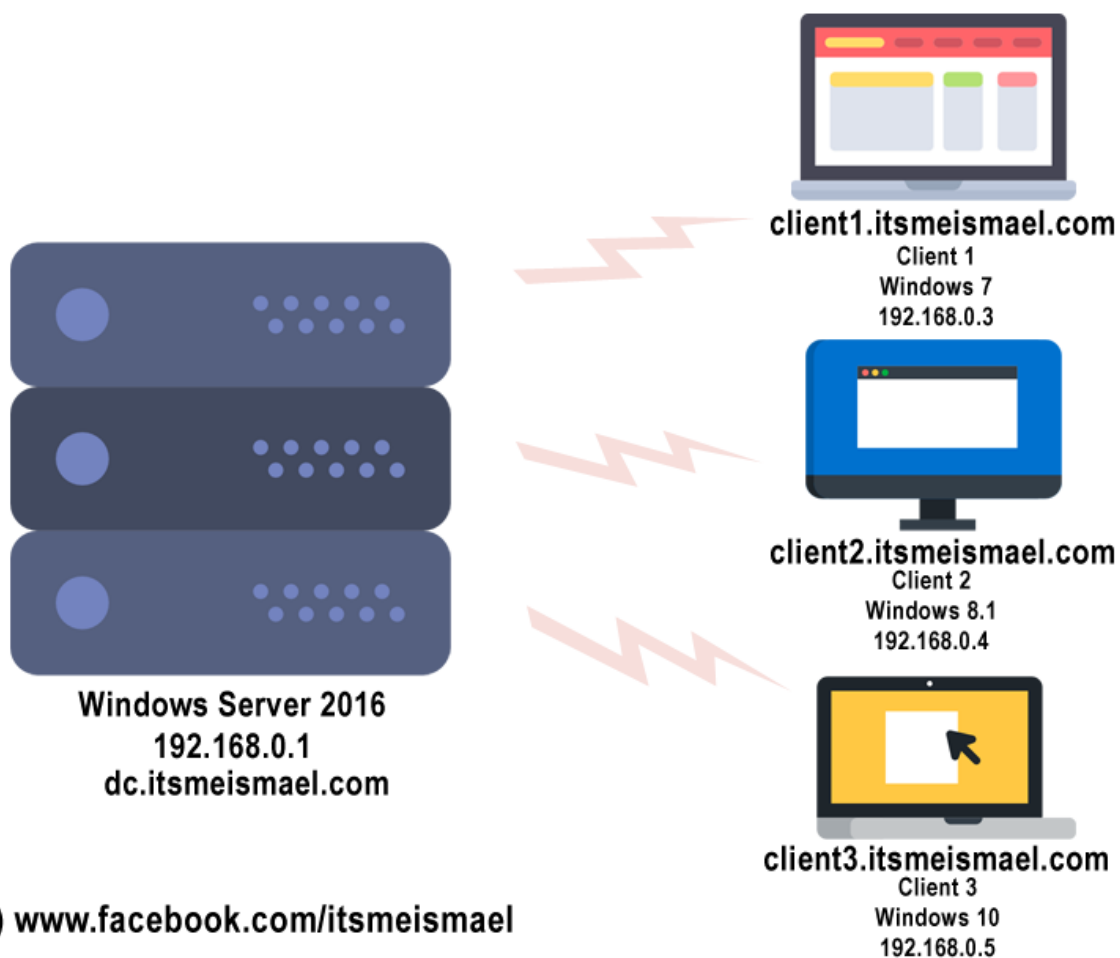
Category of Network

Server-Based Network

The term Client/server refers to the concept of sharing the work involved in processing data between the client computer and the most powerful server computer.

The client/server network is the most efficient way to provide:

- Databases and management of applications such as Spreadsheets, Accounting, Communications and Document management.
- Network management.
- Centralized file storage.



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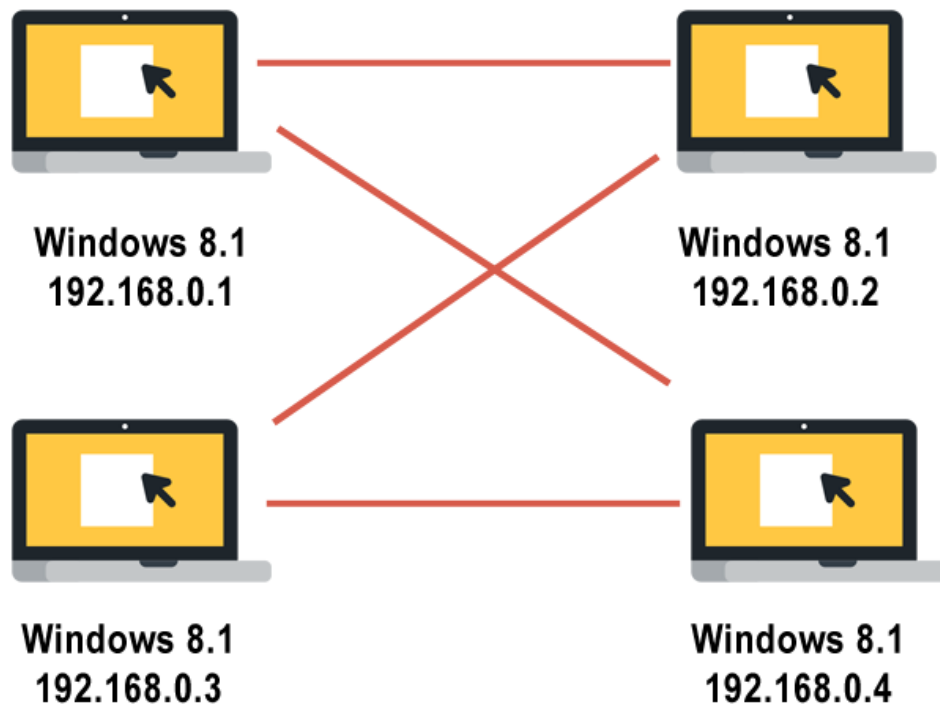
Figure 1.8: **Server based network**

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			Version 1.1.2019	
			Revision # 01	

Peer To Peer Network

- There are no dedicated servers or hierarchy among the computers.
- All of the computers are equal and therefore known as peers.

In peer-to-peer (P2P) networks, each computer acts as both a server and a client. Examples of P2P software include Skype and BitTorrent.



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Figure 1.9: Peer to peer network

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			Revision # 01	

Computer Communication Protocol

A computer communication protocol is a description of the rules computers must follow to communicate with each other.

What is TCP/IP?

- TCP/IP is the communication protocol for communication between computers on the network.
- TCP/IP stands for Transmission Control Protocol / Internet Protocol.
- TCP/IP defines how electronic devices (like computers) should be connected to the Internet, and how data should be transmitted between them.

Inside the TCP/IP standard there are several protocols for handling data communication:

- **TCP (Transmission Control Protocol)** communication between applications
- **UDP (User Datagram Protocol)** simple communication between applications
- **IP (Internet Protocol)** communication between computers
- **ICMP (Internet Control Message Protocol)** for errors and statistics
- **DHCP (Dynamic Host Configuration Protocol)** for dynamic addressing

TCP is for communication between applications.

If one application wants to communicate with another via TCP, it sends a communication request. This request must be sent to an exact address. After a "handshake" between the two applications, TCP will set up a "**full-duplex**" communication between the two applications.

The "**full-duplex**" communication will occupy the communication line between the two computers until it is closed by one of the two applications.

UDP is very similar to TCP, but simpler and less reliable.

IP is Connection-Less

- IP is for communication between computers.
- IP is a "connection-less" communication protocol.
- IP does not occupy the communication line between two computers. IP reduces the need for network lines. Each line can be used for communication between many different computers at the same time.


With IP, messages (or other data) are broken up into small independent "packets" and sent between computers via the Internet.

IP is responsible for "routing" each packet to the correct destination.

IP Routers

When an IP packet is sent from a computer, it arrives at an IP router.

The IP router is responsible for "**routing**" the packet to the correct destination, directly or via another router.

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			Version 1.1.2019	
			Revision # 01	

The path the packet will follow might be different from other packets of the same communication. The router is responsible for the right addressing, depending on traffic volume, errors in the network, or other parameters.

Communicating via IP is like sending a long letter as a large number of small postcards, each finding its own (often different) way to the receiver.

TCP/IP

TCP/IP is TCP and IP working together.

TCP takes care of the communication between your application software (i.e. your browser) and your network software.

IP takes care of the communication with other computers.

TCP is responsible for breaking data down into IP v before they are sent, and for assembling the packets when they arrive.

IP is responsible for sending the packets to the correct destination.

TCP/IP Addressing

IP Addresses

- Each computer must have an IP address before it can connect to the Internet.
- Each IP packet must have an address before it can be sent to another computer.
- This is an IP address: 31.13.95.36
- This might be the same IP address: www.facebook.com

An IP Address Contains 4 set of Numbers.

- Each computer must have a unique IP address.
- This is your IP address: 123.19.56.205
- TCP/IP uses four numbers to address a computer. The numbers are always between 0 and 255.
- IP addresses are normally written as four numbers separated by a period, like this: 192.168.1.50

32 Bits = 4 Bytes

TCP/IP uses 32 bits addressing. One computer byte is 8 bits. So TCP/IP uses 4 computer bytes. A computer byte can contain 256 different values:

00000000, 00000001, 00000010, 00000011, 00000100, 00000101, 00000110, 00000111, 00001000and all the way up to 11111111.

Now you know why a TCP/IP address is four numbers between 0 and 255.


Domain Names

A name is much easier to remember than a 12-digit number.

Names used for TCP/IP addresses are called domain names, w3schools.com is a domain name.

When you address a web site, like **http://www.cssnctwo.weebly.com**, the name is translated to a number by a Domain Name Server (DNS).

All over the world, DNS servers are connected to the Internet. DNS servers are responsible for translating domain names into TCP/IP addresses.

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			Version 1.1.2019	
			Revision # 01	

When a new domain name is registered together with a TCP/IP address, DNS servers all over the world are updated with this information.

TCP/IP Protocols

A Family of Protocols

TCP/IP is a large collection of different communication protocols based upon the two original protocols TCP and IP.

TCP - Transmission Control Protocol

TCP is used for transmission of data from an application to the network.

TCP is responsible for breaking data down into IP packets before they are sent, and for assembling the packets when they arrive.

IP - Internet Protocol

IP takes care of the communication with other computers.

IP is responsible for the sending and receiving data packets over the Internet.

HTTP - Hyper Text Transfer Protocol

HTTP takes care of the communication between a web server and a web browser.

HTTP is used for sending requests from a web client (a browser) to a web server, returning web content (web pages) from the server back to the client.

HTTPS - Secure HTTP

HTTPS takes care of secure communication between a web server and a web browser.

HTTPS typically handles credit card transactions and other sensitive data.

SSL - Secure Sockets Layer

The SSL protocol is used for encryption of data for secure data transmission.

SMTP - Simple Mail Transfer Protocol

SMTP is used for transmission of e-mails.

MIME - Multi-purpose Internet Mail Extensions


The MIME protocol lets SMTP transmit multimedia files including voice, audio, and binary data across TCP/IP networks.

IMAP - Internet Message Access Protocol

IMAP is used for storing and retrieving e-mails.

POP - Post Office Protocol

POP is used for downloading e-mails from an e-mail server to a personal computer.

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			Version 1.1.2019	
			Revision # 01	

FTP - File Transfer Protocol

FTP takes care of transmission of files between computers.

NTP - Network Time Protocol

NTP is used to synchronize the time (the clock) between computers.

DHCP - Dynamic Host Configuration Protocol

DHCP is used for allocation of dynamic IP addresses to computers in a network.

SNMP - Simple Network Management Protocol

SNMP is used for administration of computer networks.

LDAP - Lightweight Directory Access Protocol

LDAP is used for collecting information about users and e-mail addresses from the internet.

ICMP - Internet Control Message Protocol

ICMP takes care of error-handling in the network.

ARP - Address Resolution Protocol

ARP is used by IP to find the hardware address of a computer network card based on the IP address.

RARP - Reverse Address Resolution Protocol


RARP is used by IP to find the IP address based on the hardware address of a computer network card.

BOOTP - Boot Protocol

BOOTP is used for booting (starting) computers from the network.

PPTP - Point to Point Tunneling Protocol

PPTP is used for setting up a connection (tunnel) between private networks.

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			Version 1.1.2019	
			Revision # 01	

TYPES OF INTERNET CONNECTION

Cable Modem

- Data on the “cable” network , DOCSIS (Data over Cable Service Interface
- High Speed networking with the speed of 4 Mbits/s through 100 Mbits/s
- Multiple Services – capable of data and voice services

DSL

- ADSL (Asymmetric Digital Subscriber Line)
- Download speed is faster than the upload speed(asymmetric)
- It uses telephone lines
- 10,000 foot limitation from the central office
- 24 Mbits/s downstream, 3.5 Mbits/s upstream

SDSL (Symmetric Digital Subscriber Line)

- Never Standardize

VSDSL (Very High Bitrate DSL)

- 4Mbits/s through 100 Mbit/s

Dial up

- Networking with voice telephone lines, it has an analog lines with limited frequency response
- 56 kb/s modems, compression up to 320 kbit/s
- Relatively slow throughput
- Legacy system, because it is an older version of connectivity it is difficult to find modem

Fiber Optics

- High speed networking
- Converge services includes video, voice and data
- Enhanced features – it has hundreds of HD channels, 1Gbit/s

Satellite networking

- Communication to a satellite – non terrestrial communication
- High cost relative to terrestrial networking
- 5 Mbit/s downstream, 1Mbits/s upstream
- Remote sites
- High latency – 250 ms up, 250 ms down
- High frequencies – 2ghs – line of sight and rain fade

ISDN

Integrated services digital network


BRI basic rate interface (2B+D) – Two 64kbit/s bearer (B) channel, One 16 kbit/s signaling (D) channel

PRI primary rate interface – delivered over T1 or E1

E1 – 23B +D

E1 – 30B + D + alarm channel

Commonly used as connectivity from the PSTN to large phone systems (PBX)

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			Version 1.1.2019	
			Revision # 01	

Cellular Networks


- Mobile networks
- Separate land into “cell” – antenna coverage a cell with a certain frequencies
- 2G networks
- GSM – Global System for Mobile Communication
- CDMA – Code Division Multiple Access
- Poor data support – originally used circuit switching, minor upgrade for some packet switching

LTE and HSPA+

- The 3rd generation partnership project – it a collaboration between telecommunications organizations
- Long term Evolution (LTE) – based on GSM/EDGE, download speed rate of 300Mbits/s, upload speed rate 75 Mbit/s
- Evolve high speed packet access(HSPA+)- based on CDMA, download speed of 84Mbit/s upload 22 Mbits/s


WiMAX

- World interoperability for Microwave Access – wireless high speed internet access
- 30 miles signal radius
- Fixed WiMAX (Line-of-sight)
- IEEE 802.16
- 37 Mbit/s download, 17 Mbit/s upload
- Mobile WiMAX
- IEEE 802.16e-2005 – theoretically of 1Gbit/s for fixed station, mobile station throughput of 100 Mbit/s


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			Version 1.1.2019	
			Revision # 01	

REFERENCES

<https://www.scribd.com/document/327081371/Chapter-12>
<https://www.studytonight.com/computer-networks/network-topology-types>
<https://docushare.sunderland.ac.uk/docushare/dsweb/Get/Document-8380>
<https://play.google.com/store/apps/details?id=com.powersoft.osilayer&hl=en>
https://en.wikipedia.org/wiki/Computer_Fundamentals
<https://www.scribd.com/document/245692980/what-is-a-Network>
<http://cssnctwo.weebly.com/fundamentals-of-networking.html>
<https://quizlet.com/12868631/cis-110-flash-cards/>
<http://courses.aiu.edu/Telecommunications%20and%20Networking/SEC%207/SEC%207.pdf>
<https://www.slideshare.net/rajvardhan7/computer-networks-63573829>
<http://kingofnetworking.weebly.com/>
<http://kingofnetworking.weebly.com/different-types-of-computer-networks.html>
<https://www.slideshare.net/networksguy/module2ppt>
<http://www.freepatentsonline.com/8718682.html>
<https://www.scribd.com/document/25317005/Computer-Network>
<https://lmntechnohub.blogspot.com/2015/01/type-of-computer-network.html>
<https://in.answers.yahoo.com/question/index?qid=20091102115757AAR5jg9>
<http://psa.gov.ph/content/2015-survey-information-and-communication-technology-information-economy-preliminary-results>
<https://www.conceptdraw.com/examples/mpis-cloud-visio-stencil>
<https://www.scribd.com/document/246472228/Data-Communication>
<https://www.quora.com/What-are-the-differences-among-LAN-local-area-network-WAN-wide-area-network-and-SAN-storage-area-network>
https://www.digi.com/pdf/wp_esxserver_anywhereusb.pdf
<https://www.top10-websitehosting.co.uk/internet-facts-and-statistics-2018/>
<https://www.coursehero.com/file/p4kidtk/Internet-It-is-a-network-of-networks-that-consists-of-millions-of-private/>
<https://en.wikipedia.org/wiki/Portal:Internet>
<https://www.bartleby.com/essay/Effects-of-the-Internet-on-Information-Systems-PKVMJZEKRYYS>
<https://www.scribd.com/presentation/183476944/Networking>
<https://www.scribd.com/document/189607866/Training-Report-on-CCNA-Cisco-Certified-Network-Associate>
<https://www.amd.com/en-us/press-releases/Pages/worlds-most-powerful-2014aug06.aspx>
<https://www.facebook.com/Neepali-Boys-237204932983075/posts>
<http://walkwidnetwork.blogspot.com/2013/04/categories-of-network.html>

	CBLMs on Computer System Servicing NC II Setup Computer Network	Developed by Ismael Manic Balana	Document No.	
			Version 1.1.2019	
			Revision # 01	

http://qa.answers.com/Q/Is_a_dedicated_server_required_for_peer_to_peer_networks
http://www.academia.edu/6090284/Relationship_of_English_language_proficiency_to_the_students_academic_performance
<https://www.termpaperwarehouse.com/essay-on/Networking/165760>
<http://dictionnaire.sensagent.leparisien.fr/Computer%20networking/en-en/>
<https://quizlet.com/64818463/data-comm-chapter-1-flash-cards/>
<https://www.scribd.com/document/339654366/Project-Design-2>
<https://in.answers.yahoo.com/question/index?qid=20080512023246AAO6MfU>
<https://quizlet.com/49430706/chapter-2-quiz-flash-cards/>
https://www.researchgate.net/post/What_is_VPN
<http://techtalkznow.blogspot.com/2013/04/>
<https://quizlet.com/2110111/networking-concepts-flash-cards/>
https://www.proprofs.com/mwiki/index.php/Ultimate_Network%2B_Study_Guide

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			Version 1.1.2019	
			Revision # 01	

SELF CHECK 2.2-1

Learner's Name: _____ **Date:** _____

Direction: Encircle the best answer. If you chose the wrong answer, don't fight for it, instead let go and moved on, or else you'll get hurt. Don't play with questionnaire, it did nothing to you. Answer according to your mind and heart's content, and pray that this test will love you back. ☺ GOODLUCK!!!
STRICTLY NO ERASURE!

1. It is a group of computer systems and other computing hardware devices that are linked together through communication channels to facilitate communication and resource-sharing among a wide range of users.

- a. Ethernet
- b. Internet
- c. computer network
- d. wireless router

2. usually a small network constrained to a small geographic area

- a. wide area network (WAN)
- b. metropolitan area network (MAN)
- c. local area network (LAN)
- d. Personal Area Network (PAN)

3. Is a hybrid between a LAN and a WAN, it connects two or more LANs in the same geographic area.

- a. metropolitan area network (MAN)
- b. Personal Area Network (PAN)
- c. wide area network (WAN)
- d local area network (LAN)

4. Is a computer network used for communication among computer devices, including telephones and personal digital assistants, in proximity to an individual's body.

- a. metropolitan area network (MAN)
- b. Personal Area Network (PAN)
- c. local area network (LAN)
- d. wide area network (WAN)

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			Version 1.1.2019	
			Revision # 01	

5. is a computer network that covers a broad area

- a. Personal Area Network (PAN)
- b. local area network (LAN)
- c. storage area network (SAN)
- d. wide area network (WAN)

6. Is a dedicated storage network that provides access to consolidated, block level storage.

- a. storage area network (SAN)
- b. wide area network (WAN)
- c. local area network (LAN)
- d. Personal Area Network (PAN)

7. It is a global system of interconnected computer networks that use the standard Internet Protocol Suite (TCP/IP) to serve billions of users worldwide.

- a. The Ethernet
- b. The Internet
- c. wireless router
- d. VPN

8. It is private network that is constructed within a public network infrastructure such as the global Internet


- a. VPN (Virtual Private Network)
- b. client/server
- c. Category of Network
- d. Peer to Peer Network

9. Refers to the concept of sharing the work involved in processing data between the client computer and server computer.

- a. virtual Private Network
- b. windows server
- c. client/server
- d. Peer To Peer Network

10. There are no dedicated servers or hierarchy among the computers.


- a. virtual Private Network
- b. wireless router
- c. client/server network
- d. Peer to Peer Network

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			Version 1.1.2019	
			Revision # 01	

ANSWER KEY 2.0-1

MULTIPLE CHOICE

1. C
2. C
3. A
4. B
5. D
6. A
7. B
8. A
9. C
10. D

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			Version 1.1.2019	
			Revision # 01	